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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,897	02/23/2004	Tomonobu Tsuchiya	NITT.0194	5946

7590 08/08/2005

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EXAMINER

SOWARD, IDA M

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 08/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/782,897

Applicant(s)

TSUCHIYA ET AL.

Examiner

Ida M. Soward

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 February 2004.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☒ Claim(s) 4 is/are allowed.
6) ☒ Claim(s) 1,2,12,15 and 18 is/are rejected.
7) ☒ Claim(s) 3,5-11,13,14,16,17 and 19 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 23 February 2004 is/are: a) ☒ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2-23-04.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the application filed February 23, 2004.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

The drawings are objected to because the reference numbers on pages 13-14 of the specification do not coincide with any of the Figures of the Drawings. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet"

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pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description:

1. **30, 31 and 32** In Figure 1; and
2. **18** in Figure 9.

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya (US 6,853,015 A1) in view of Seko et al. (5,253,265).

In regard to claim 1, Tsuchiya teaches a semiconductor optical device, comprising: an InP substrate 1; an active region 6 formed above the InP substrate 1, the active region 6 being comprised of a quantum well structure; optical guiding layers 3 & 7 each formed on and under the active region 6; and clad layers 8 & 11; wherein on sides in the direction crossing the light-emitting direction, the sides of the active region 6 are buried with semiconductor layers 19, 20 & 21; and wherein a composition of Al of the quantum well layer is in the group consisting of InGaAlAs compound semiconductor layers, a composition ratio of the Al being in the range of 0.04 to 0.44 which fits in the range of 0 to 0.13, both inclusive (Figure 10; columns 5, 7 and 9-10; lines 42-52, 20-59, 58-67 and 1-22; respectively).

However, Tsuchiya fails to teach semiconductor layers having band gap energy greater than that of a quantum well layer.

Seko et al. teach semiconductor layers having band gap energy greater than that of a quantum well layer 4 (Figure 1, column 4, lines 50-60).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor optical device structure as taught by Tsuchiya with the semiconductor optical device including semiconductor layers having band gap energy greater than that of a quantum well layer as taught by Seko et al. to provide a semiconductor optical device with a light confinement effect (column 4, lines 50-60):

In regard to claim 2, Tsuchiya teaches a composition ratio of Al of the quantum well layer in the range of 0.04 to 0.44 which is in the range of 0.01 to 0.1, both inclusive (column 5, lines 42-52).

In regard to claim 12, Tsuchiya teaches a photoluminescence wavelength from the active region of 1000 nm or more which is within the range of 1.36 μm to 1.48 μm (column 8, lines 4-17).

In regard to claim 15, Tsuchiya teaches a barrier layer constituting the active region is p-type doped (column 2, lines 16-23).

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya (US 6,853,015 A1) and Seko et al. (5,253,265) as applied to claims 1-2, 12 and 15 above, and further in view of Steinberg et al. (US 2003/0123816 A1).

Tsuchiya and Seko et al. teach all mentioned in the rejection above.

However, Tsuchiya and Seko et al. fail to teach an optical module at least including a package substrate and a semiconductor optical device mounted on the package substrate.

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Steinberg et al. teach an optical module at least including a package substrate and a semiconductor optical device mounted on the package substrate (Figure 1, page 1, paragraph [0021]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor optical device structure as taught by Tsuchiya and the semiconductor optical device including semiconductor layers having band gap energy greater than that of a quantum well layer as taught by Seko et al. with the optical module at least including a package substrate and a semiconductor optical device mounted on the package substrate as taught by Steinberg et al. to provide ease of assembly (page 1, paragraph 0011)).

Allowable Subject Matter

Claim 4 is allowed.

The following is a statement of reasons for the indication of allowable subject matter: The prior art of record does not disclose, make obvious, or otherwise suggest the structure of the applicant's together with the other limitations of the independent claims, such as wherein the composition ($\text{In}_{1-x-y}\text{Ga}_x\text{Al}_y\text{As}$) of the quantum well layer is in the group consisting of compositions E (In: 0.52, Ga: 0, Al: 0.48), F (In: 0.53, Ga: 0.47, Al: 0), C (In: 0, Ga: 1.0, Al: 0), and G (In: 0, Ga: 0, Al: 1.0) in the composition diagram of the four-element based compound semiconductor materials; and wherein the quantum

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well layer has tensile strain. The dependent claims being further limiting and definite are also allowable.

Claims 3, 5-11, 13-14, 16-17 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to further show the state of the art with respect to optical semiconductor devices:

Higashi et al. (5,952,673)

Ikeda et al. (US 6,911,713 B2)

Ishizaka et al. (6,150,667)

Johnson et al. (US 6,407,407 B1)

Kasukawa et al. (5,929,462)

Morimoto (5,753,933)

Muto et al. (4,929,984)

Uomi et al. (5,132,981).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ida M. Soward whose telephone number is 571-272-1845. The examiner can normally be reached on Monday - Thursday 6:30am to 5:00pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

IMS

August 1, 2005

John M. Howard
AU 2822